The Challenge and The Opportunity

• From the *Staff Report to the Secretary on Electricity Markets and Reliability* (Aug 2017)
  – “The U.S. electricity industry is facing unprecedented changes.”
  – “Stakes are high... electricity is crucial to modern society and economic activity... drives an $18.6 trillion U.S. GDP”
  – “Markets need further study and reform to address future services essential to grid reliability and resilience.”

• From the *International Energy Outlook 2017*
  – Total world energy consumption will rise to 736 quadrillion BTUs in 2040 (28% increase from today)
Foundations of ESSAI

• **Premises**
  – The U.S. must maintain an appropriate energy mix to ensure its electricity system is reliable, resilient, and affordable, now and in the future.
    • Understand factors leading to current trend of nuclear power plant closures in the U.S.; and unintended consequences.
    • Understand barriers to commercializing nuclear technologies in the U.S.
  – Understand the economic impact and national security considerations for the U.S. relative to global energy growth.

• **Mission**
  – Public-facing framework aimed at providing timely, quantified, and unbiased data to inform global clean energy investment and policy decisions through comprehensive interdisciplinary research with a focus on the role of nuclear energy.
## Activities & Outcomes to Date

<table>
<thead>
<tr>
<th>Subject/Title</th>
<th>Date</th>
<th>Participants</th>
<th>Outcome</th>
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<tbody>
<tr>
<td>Summit on Improving the Economics of America’s Nuclear Power Plants</td>
<td>5/15/16 – 9/30/16</td>
<td>INL, U-WY, GAIN</td>
<td>(9/30/16) Report (posted on GAIN site)</td>
</tr>
<tr>
<td>Regional Economic and Market Challenges Facing the U.S. Nuclear Commercial Fleet</td>
<td>5/15/16 – 8/30/16</td>
<td>INL, NEGC, Grecheck, GAIN</td>
<td>(8/30/16) Report (posted on GAIN site)</td>
</tr>
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</table>
(11/1/17) Report of Findings and Potential Briefings (as requested by DOE NE) to Specific Stakeholders |
| Diablo Canyon - Use Case                                                     | 5/1/17 – 5/31/17   | INL                                    | (8/24/17) Technical Memo (OUO) contribution to Staff Report to the Secretary on Electricity Markets and Reliability (SR-EM) |
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<td>Grid Reliability and Resiliency Needs</td>
<td>5/1/17 – 5/31/17</td>
<td>INL</td>
<td>(8/24/17) Technical Memo (OUO) contribution to Staff Report to the Secretary on Electricity Markets and Reliability</td>
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<td>Economic and Market Challenges Facing the U.S. Nuclear Commercial Fleet – Cost and Revenue Study</td>
<td>5/1/17 – 9/30/17</td>
<td>INL, NEGC, Grecheck</td>
<td>(9/30/17) Report (delivered to LWRS program)</td>
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<td>Sensitivity Analysis of Least Cost Technology For Advanced Reactors – Resolved per U.S. County</td>
<td>7/1/17 – 9/30/17</td>
<td>CAES; ISU; U-Texas; GAIN, Third Way</td>
<td>(9/30/17) Report; Evaluating potential for GAIN / Third Way press release</td>
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<td>Advanced Reactor Value Chain – Opportunities for Idaho</td>
<td>9/30/17 – 2/28/18</td>
<td>ISU, U-WY, UI, BSU, INL, LINE; Industry; GAIN</td>
<td>2/30/18 Report – Potential Market Opportunities, PPP Mechanisms, Incentives and Barriers to Attract Industry</td>
</tr>
<tr>
<td>Analyzing the U.S. Nuclear Power “Reverse Learning Curve”</td>
<td>5/1/17 – 9/30/17</td>
<td>INL</td>
<td>(~10/1/17) Report</td>
</tr>
<tr>
<td>Enabling Advanced Reactors for the Market Workshop</td>
<td>3/1/17 – 3/30/18</td>
<td>INL; GAIN; NEI; EPRI; Industry; GWU</td>
<td>(3/30/18) Workshop hosted by GWU</td>
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Economic and Market Challenges Facing the U.S. Nuclear Commercial Fleet – Cost and Revenue Study

• Identifies economic and electricity market factors leading to early retirement
• Assesses gaps between operating revenues and operating costs
• Main findings
  – Market failure is the problem, not nuclear power plants
  – Regulated / public power nuclear units provide value to owners
  – Existing nuclear units are cheaper than building new baseload capacity

• Problem
  – Identify, assess, and quantify, where possible, key national security implications of US technology leadership in advanced nuclear energy

• Focus Areas
  – Geo-regional influence, National economic implications, Technology influence

• Approach
  – Engaged the JASON advisory group; “independent group of elite scientists which advises the U.S. Government on matters of science and technology”

• Outcomes
  – October 2017 draft; to be briefed (or not) in accordance with customer instruction
  – Draft submitted to Issues in Science in Technology Commercial Nuclear Power at Sixty: Global Competition and the Next Sixty Years of U.S. Leadership
  – Proposal for FY2018: Nuclear energy supply chain national strategy & action plan
Proposed Strategic Outcomes

- ESSAI’s strategy is to provide data to inform and align goals of entities in the partnerships list.
  - Characterized data sets, models / tools, and analysis products.
  - Interdisciplinary systems analysis capability for both quick turnaround and longer-term academic studies.
  - Comprehensive knowledge management and stakeholder engagement mechanisms.
  - Participation from national and international partners.
  - Build-out of a publically available publications library that includes study reports, journal articles and conference papers, webinars, and annual reports.
Proposed Partnerships List

- ESSAI is establishing partnerships among the following entities:
  - DOE, investors, and DOE-sponsored research institutions
  - Government agencies, policy groups, and universities
  - Owner-operators (utilities) and RTOs / ISOs (Regional Transmission Organization, Independent System Operator)
  - DOD and think tanks
  - Economic development organizations
  - Reactor vendors, suppliers, and private investors